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DOCUMENT-IDENTIFIER: US 6215893 B1

TITLE: Apparatus and method for
measurement and temporal
comparison of skin surface
images

DATE-ISSUED: April 10, 2001

INVENTOR-INFORMATION:

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COUNTRY	FOREIGN-APPL-PRIORITY-DATA:
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IL	124616
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US-CL-CURRENT: 382/128, 382/164 , 382/165

ABSTRACT:

Apparatus and method for temporal comparison of skin surface images which is fully automatic and based on robust parameters, using a CCD camera provided with telecentric optics to enabling the capture of

images with constant magnification independent of the camera-object distance. The camera is linked to a PC with a frame grabber for storing the image and processing means for calibrating light and for calculating statistics of the image. The illumination source provides a homogeneous illumination of the skin, and the light is calibrated by transforming an acquired image into the model image which would have resulted if illumination of the object were solely by the reference (white) light. Three monochromatic images are produced, one for each of three color channels. The three images are grabbed and processed, and a combination of these three images gives the true color (red, green and blue or RGB) image. An algorithm uses the image and reference image to calculate the skin/lesion border which the eye would suggest if the lesion was illuminated by a standard white light. The image is processed to give the contour of the lesion, and statistics are extracted to score the necessary parameters (metrics). Therefore, the physician is provided with various metrics in a more reliable fashion than could be done manually and these are displayed together with the images obtained at various times. The images can be examined for visual changes over time and for quantitative change in the metrics over time, providing a comprehensive solution to the problems encountered in previous lesion tracking systems. The system assists the physician in the decision making process of malignancy determination. The features are extracted in a

manner which is fairly immune to noise, i.e. robust, thus leading to a high repeatability and reliability of the system. The features extracted have a high correlation with the malignancy of the lesion enabling the physician to make a decision regarding the type of lesion with high specificity and sensitivity.

16 Claims, 8 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 8

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Detailed Description Text - DETX (15):

Initially, in block 50, clusters which definitely belong to skin or lesion are extracted. This decision is based on color proximity to the a priori skin/lesion color estimates, the physical size of the part of each color cluster residing in the a priori assumed skin or lesion area (i.e. how many pixels out of the specific cluster reside in the a priori assumed skin or lesion area) and the distance of the physical center of the color cluster from the center of the a priori approximation of the lesion. Based on these metrics a score is calculated for each cluster, for its probability to be a skin cluster and for its probability to be a lesion cluster. Then, starting from the clusters having the highest score for either the skin or the lesion,

clusters are consecutively assigned to be a definite skin or lesion cluster, until a certain fraction of the a priori lesion and skin area is accounted for by definite clusters.

Claims Text - CLTX (5):

separating said skin color region of interest into color clusters and color islands represented by data values associated with said digital image;

Claims Text - CLTX (30):

means for separating said skin color region of interest into color clusters and color islands represented by data values associated with said digital image;